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ABSTRACT

Integration of academic and vocational curricula is missing from most American classrooms because integration that is rigorous, authentic, and sustained is much more difficult than most advocates imagine. The difficulty arises because teachers must do the following: keep integration sharply focused on clear, well-defined educational objectives; find legitimate applications that really excite students; and be able to meet the demands of time, expertise, and resources that are beyond the reach of most teachers. Academic and vocational curriculum should be integrated to increase student achievement, especially for those students who have not fared well in the traditional curriculum, and to benefit all students. Whatever form integration takes, it should begin by clearly specifying the educational goals: clearly targeted, well-defined educational objectives; use of academic and industry skill standards to direct integrated learning; and teachers who remain focused on primary learning objectives, so that any decisions to temporarily diverge from these aims are made consciously, explicitly, and with a better understanding of the costs of the benefits. Requiring increasing degrees of planning, coordination, and commitment, the four different forms of integration for teachers to consider are as follows: course-level integration, cross-curriculum integration, programmatic integration through career clusters and industry majors, and schoolwide integration, such as academies and other models. (Contains 25 references.) (YLB)

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Integrating Academic and Vocational Curriculum—Why Is Theory So Hard to Practice?

BY GARY HOACHLANDER

At first blush, the assertion that learning is enhanced by doing, that we master knowledge and skills by applying them to practical problems encountered in the daily course of working and living, is quite humdrum. Who among us does not learn more easily when motivated by a problem that is intrinsically interesting or that offers some personal, social, or financial reward? And yet, while this insight seems so self-evident, incorporating it into the daily business of teaching and learning in our nation's schools has proven extraordinarily difficult.

The idea that students learn more quickly and thoroughly if they understand how people use academic knowledge and skill in the worlds of work has been around for some time. Almost a century ago, John Dewey (1916) wrote in *Democracy and Education*, "Education through occupations...combines within itself more of the factors conducive to learning than any other method." Throughout the twentieth century, national commissions on vocational education repeatedly urged stronger connections to the academic curriculum (Grubb, 1995b). Integrating academic and vocational/technical education is one of the major policy objectives of the Carl Perkins Vocational Education Act, expressed first in 1985 and subsequently restated in the 1990 and 1998 reauthorizations. It is also a policy hallmark of the School to Work Opportunities Act.

The concept has a growing number of adherents. During the past ten years, some schools—especially those implementing career academies, career majors, student projects, and other innovations that demand significant curriculum changes—have made integration a key strategy for improving teaching and learning (Stasz, Kaganoff, & Eden, 1995).

Nevertheless, these innovators are more the exception than the rule. As anyone familiar with the typical high school or community college knows, there is remarkably little integration to be found, in either vocational or academic classes.

How can this be so? Why is such a sensible learning strategy missing from most American classrooms?

There is an easy answer: integration is hard to do. Integration that is rigorous, authentic, and sustained is much more difficult than most of its advocates imagine. There are several reasons for this difficulty.

First, to be effective, an integration activity must accomplish an important, well-defined educational objective. Integration is not an end in itself, no matter how engaging the activity may be. Yet precisely because integrated curriculum emphasizes connections and context, it is often easy to lose focus and clear meaning.

Second, effectively integrating academic and vocational curriculum depends on much more than simply identifying work-related applications of academic knowledge and skill, no matter how advanced those applications may be. Presenting students with an algebra problem requiring the application of Ohm's

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Why Integrate Academic and Vocational Curriculum?

(1) Integration must be guided by one central purpose: to increase student achievement.

(2) Well conceived and effectively delivered, integrated instruction can benefit any student.

law is not necessarily more engaging than the pointless puzzle of determining the meeting point of two trains, one starting from New York at 40 miles per hour and the other from Los Angeles at 60. It is a superior problem only if the world of electronics, the context for the problem, holds genuine interest for the student and, ideally, the teacher as well. However, what interests one student may well bore another. Sorting out what fascinates whom in a class of 20 students (let alone in four or more classes each day), and then defining bona fide applications of academics in a variety of different areas, can overwhelm the most dedicated teacher.

Third, even if a teacher succeeds in keeping integration sharply focused on clear, well-defined educational objectives and in finding legitimate applications that really excite students, doing this day after day, week after week in a fashion that builds systematically on previous activities is challenging. Constructing a rich, complex, cumulative integrated curriculum that simultaneously helps students master an academic discipline and apply it in a coherently defined domain of the work world demands time, expertise, and resources that are beyond the reach of most teachers. While some organizations are working hard to produce well designed integrated curricula—for example, the efforts of the Center for Occupational Research and Development (CORD) or the New Standards Project—the stock of sound, tested materials is still quite limited.

These are substantial obstacles to making integration a more common practice in the nation's classrooms. Consequently, what sorts of strategies can schools and teachers adopt to make integration an easier and more effective tool? Here are some guidelines that should help, beginning with a clear rationale for pursuing integration in the first place.

Why Integrate Academic and Vocational Curriculum?

If integration is so difficult, why is it worth the effort? There is really only one answer: to increase student achievement, especially for those students who have not fared well in the traditional curriculum. For 60 to 70 percent of the nation's high school students and perhaps as many as half of the students enrolled in community colleges, the academic curriculum that prepares students for four-year college has been out of reach. Not able to learn well when complex material is presented abstractly or disconnected from recognizable applications, these students have usually been relegated to a considerably less demanding "general" curriculum and to vocational programs that often are occupationally narrow and lack much technical content. As a result, far too many students leave formal education inadequately prepared, academically or vocationally, for a lifetime of sustained working and learning.

The intense focus nationally and in virtually every state on raising academic standards, increasing high school graduation requirements, and improving postsecondary completion rates indicates that schools and colleges are serious about improving this situation. But force-feeding a traditional academic curriculum to all students is not likely to produce the desired result. There is increasing evidence that many students are able to master much higher levels of knowledge and skill when educators pay more careful attention to the wide range of student learning styles and modify instruction to accommodate them (Gardner, 1993). Therefore, in addition to standards, new instructional strategies must also be developed.

Providing a program of integrated academic and vocational curriculum offers one promising alternative. It is by no means the only alternative. In fact, it is neither necessary nor desirable to integrate all instruction. Moreover, as with any tool, it is possible to use integration skillfully or unproductively. It is usually most effective when combined with other instructional methods, including such conventional practices as lecture and drilling

(Schmidt, Jennings, & Beeken, 1993). At all times, however, integration must be guided by one central purpose: to increase student achievement. If this objective is kept squarely in mind, then teachers are less likely to view integrated teaching as merely another mandated burden diverting them from their primary mission. On the contrary, integration offers teachers an important tool for raising the achievement of underperforming students.

So is integration only for the "non–college bound?" Not at all. Students who are successful in the college preparatory curriculum often succeed in spite of the curriculum, not because of it. They may have a greater aptitude for abstraction, as well as perhaps a greater tolerance for a curriculum that does not offer immediate understanding of the subject's utility. They can, however, benefit from integrated instruction that solidifies and deepens their understanding of academics (Bailey, 1997).

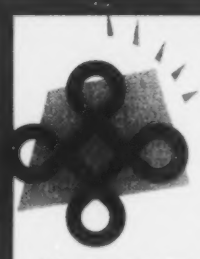
In short, when well conceived and effectively delivered, integrated instruction can benefit any student. This is, in fact, one of its great advantages over other instructional strategies that depend on segregating students by ability. What, then, are some of the key ingredients for practicing integration effectively?

Clearly State Educational Objectives: The Role of Standards

Whatever form integration takes, from a single short-term student project to an entire school organized around a major industry like health or transportation, it should begin by clearly specifying the educational goals. It is very easy to get caught up in the novelty and excitement of integrated learning and lose sight of the learning objectives. One way to avoid this trap, while still maintaining the fun and excitement, is to use academic and industry skill standards to direct integrated learning (Bailey & Merrit, 1997; Rossi, Hoachlander, Mandel, Rahn, & Sanborn, 1998).

Nationally and in many states, there are now standards describing what students are expected to know in each of the major academic disciplines. Although these statements vary in both content and attention to differences among grade levels, they are good starting points for specifying academic learning objectives. Similarly, the U.S. Departments of Education and Labor have sponsored 22 projects devoted to identifying content standards for selected industries, such as electronics and retailing. The National Skill Standards Board is currently expanding on these early efforts to develop more comprehensive and uniform statements of industry skill standards.

These standards offer teachers an effective strategy for focusing integrated instruction. Take a simple example based on the work of a group of teachers in Maryland, a state actively building the capacity of teachers to use integration (Maryland uses the term "blended instruction") to accomplish the state's core learning goals.



Clearly State Educational Objectives: The Role of Standards

Whatever form integration takes, it should begin by clearly specifying the educational goals:

(1) Clearly target well defined educational objectives.

(2) Use academic and industry skill standards to direct integrated learning.

(3) If teachers remain focused on primary learning objectives, decisions to temporarily diverge from these aims can be made consciously, explicitly, and with a better understanding of the costs of the benefits.

Standards-Based Integration: An Illustration

Charged with designing a project that would integrate one to two weeks of English and bioscience instruction in their high school, a group of English, biology, and health teachers began by reviewing the English standards that were the focus of the upcoming semester and the industry skill standards developed for bioscience. To keep their first experience with integration tightly focused and relatively simple, they selected

Significant integration can be accomplished within a high school's existing framework of academic and vocational courses. It is by no means necessary to undertake immediately large-scale restructuring of curriculum, teaching, and school organization.

one English standard and one bioscience standard to guide the project:

> *English:*
> The student will construct, examine, and extend meaning of traditional and contemporary work recognized as having significant literary merit.
>
> *Bioscience:*
> Assuming the role of a technician in a laboratory that uses radioactive compounds, the student will (1) explain potential causes of radioactive contamination and its consequences, (2) describe the safety protocols that need to be followed regularly to minimize the hazards of contamination, and (3) identify which of these procedures might apply to other kinds of contamination (e.g., viral) resulting from laboratory activities.

The teachers began by brainstorming various approaches to designing the project. It so happens that a common laundry detergent, *Tide*, is visible under ultraviolet light. Consequently, one of the science teachers suggested using *Tide* to simulate a laboratory accident that contaminates the high school. After first period science class, students would go about the rest of their day carrying a small pouch leaking detergent powder. The following day, students would use portable ultraviolet lights to find, measure, and trace the dispersal of the "contaminant" throughout the high school. Collecting and analyzing data on the extent and patterns of contamination, students would suggest and evaluate ways to avoid or minimize the consequences of accidental contamination.

As part of this project, the students would also draw upon relevant literature. For example, some would read Eve Curie's biography of her mother, *Madame Curie*, discussing the risks that researchers unknowingly or knowingly assume in the pursuit of new scientific knowledge. Others would read Richard Preston's *The Hot Zone* and examine the differences and similarities between contamination in their high school and the global spread of deadly viruses or other diseases. Michael Crichton's *The Andromeda Strain* would provide an opportunity to discuss the contribution of science fiction, positively and negatively, to the public's understanding of scientific issues and public policy concerns.

The product of this project would be an investigative report on the "contamination accident" at the high school. How did the contaminating powder spread throughout the high school? Where was it most heavily concentrated and why? Were the patterns of contamination consistent with what might be expected from previous theory and research on the subject? Why or why not? Who was "exposed," with what possible consequences, and how and why did exposure vary among the high school community? What procedures would have prevented or minimized contamination? What steps could have been taken to address the problem once it occurred? Can the findings from this activity be applied to better understanding other kinds of contamination, such as environmental disturbances resulting from the infiltration of nonnative species?

Several key attributes of this project are worth highlighting. First, it is clearly targeted on a few well defined educational objectives. It is highly likely that students (and teachers!) will emerge from this project with an understanding of the causes and consequneces of contamination, its importance in the bioscience field, and the contribution of a range of literary works to deepening and broadening one's understanding of applied science and the public health and policy issues it presents.

Second, the expertise of both academic and vocational/technical teachers is critical to the project's design. It is not likely that any one of them could have designed this project alone.

Third, the project contributes directly and substantially to the students' mastery of the standards established for this part of the high school curriculum at this stage of instruction. The project is not a diversion, a burdensome add-on, or a gimmicky frill. If it produces the desired learning, it is time well spent.

As with almost any integrated activity, some seductive detours lurk in this project.

For example, the ultraviolet lights used as "contamination detectors" in the project raise a number of interesting questions. Why is the detergent visible under ultraviolet light? What is ultraviolet light exactly? What sorts of scientific and industrial applications does ultraviolet light have? Were this project intended to develop students' understanding of the light spectrum and related aspects of physics, such questions would, of course, be highly germane. But that is *not* the educational objective of this project, and teachers must be very cautious about devoting time to exploring enticing tangents.

How far to go down such interesting but ancillary paths is an important judgment call teachers must make. While they understandably want to be attuned to these "teachable moments," they also must teach the material for which they are directly accountable. How much tangential learning to allow is an important question. The dilemma underscores the importance of using standards to direct integration. If teachers remain focused on each activity's primary learning objectives, decisions to temporarily diverge from these aims can be made consciously, explicitly, and with a better understanding of the costs and benefits.

Forms of Integration: From Classroom to Schoolwide Initiatives

As the above example illustrates, integration efforts can be quite modest. For teachers new to integration, it is wise to begin with a simple and limited activity. Three teachers spent less than two hours designing this project, which was completed in about 8 to 10 class periods. Only 25 students participated directly, although every student and teacher in the high school was surely aware of the initiative as students tracked down the contaminants throughout the building. It is possible, therefore, for just a few teachers to begin using integration as part of their instructional practices.

However, integration can also be pursued more systematically and comprehensively, assuming much more prominence in the curriculum and even the mission of the entire school (Grubb, 1995c). Requiring increasing degrees of planning, coordination, and commitment, there are at least four different forms of integration for teachers to consider: (1) course-level integration within the existing vocational and academic curriculum, (2) cross-curriculum integration, using horizontal and vertical alignment, (3) programmatic integration around career clusters or industry majors, and (4) schoolwide integration using academies or other strategies for thematically defining the mission of an entire school.

Forms of Integration: From Classroom to Schoolwide Initiatives

Requiring increasing degrees of planning, coordination, and commitment, there are at least four different forms of integration for teachers to consider:

(1) Course-level integration

(2) Cross-curriculum integration

(3) Programmatic integration

(4) Schoolwide integration

Course-Level Integration

To begin reaping the benefits of integration, more academic content can simply be added to existing vocational courses, and more work-related applications can be added to academic courses. Significant integration can be accomplished within the existing framework of academic and vocational courses within a high school. It is by no means necessary to undertake immediately large-scale restructuring of curriculum, teaching, and school organization.

The essential ingredient for introducing this form of integration is changing teacher mindsets (Bottoms, Pucel, & Phillips, 1997; Little, 1992). Vocational teachers must take responsibility for *directly* teaching selected aspects of academic subjects, and academic teachers must commit to using work-related applications of academic concepts and skills as part of their instructional routine. A masonry instructor, for example, devotes a significant portion of class time to teaching the measure-

Traditionally, vocational programs have been conceived rather narrowly, designed to prepare students for specific, entry-level occupations. Increasingly, high schools are adopting a broader, longer-range perspective to determine the focus and scope of preparation for work.

ment, fractions, ratios, proportions, and simple algebra needed to work with bricks and mortar. Similarly, an algebra teacher engages students in practical applications of formulas, solving for unknown quantities, or graphically representing mathematical relationships. For example, students might explore the role algebra plays in aircraft design and the importance of understanding the mathematics of lift, thrust, and drag (Hoachander, 1997).

This approach requires significant curriculum changes, but these are alterations can be made by individual teachers or teachers working in small groups. This is an ideal starting place for the single teacher trying to figure out how he or she alone can make a difference in student learning.

Cross-Curriculum Integration

More opportunities are available to a group of academic and vocational teachers interested in a coordinated, joint approach to integration. As a team, they look for ways to connect academic and vocational courses. As one group of integration practitioners puts it (Berman & Steinberg, 1997), this strategy combines the teaching of technical procedures (the "hows") with the academic principles underlying these procedures (the "whys").

The contamination project described above is one example of this approach. However, a more systematic and sustained strategy uses curriculum alignment to identify promising opportunities for linking academic and vocational instruction. For example, academic and vocational teachers each map out the work planned for an upcoming semester. Then, by reordering the sequence in which particular content is taught in each course, the group defines key points where the material in one class directly complements and reinforces material in another. These "intersections" are ideal times for team teaching and cross-curriculum student projects.

Cross-curriculum integration does not require teachers to change *what* they teach; they continue to cover the same content (which often is strictly prescribed by state or local curriculum requirements) they always have. All that is needed to make effective use of integration opportunities is to alter the *timing* of the required academic and vocational content to create opportunities for integrated learning.

Programmatic Integration Through Career Clusters and Industry Majors

A more ambitious approach to integration—involving more teachers, planning, coordination, and curriculum changes—focuses on defining challenging, coherent, multi-year programs of academic and vocational instruction. Traditionally, vocational programs have been conceived rather narrowly, designed to prepare students for specific, entry-level occupations immediately upon graduation from high school or community college. But increasingly, high schools are adopting a broader, longer-range perspective to determine the focus and scope of preparation for work.

Organized around career clusters or industry majors, rather than specific occupations, these programs comprise a rich complement of academic and vocational/technical courses that prepare students for college, as well as career. They can include programs that span four to six years of secondary and postsecondary education, like tech prep, or somewhat shorter programs limited to either high school or college offerings. These programs are especially well-suited to work-based learning strategies, because their long-term program of study makes it easier to establish enduring connections, whether in the workplace or through school-based enterprises (Stasz & Stern, 1998; Stern, Stone, Hopkins, McMillion, & Crain, 1994).

A broad concentration, such as health, in contrast to a more narrow focus like inhalation therapy or even nursing, has several benefits (Hoachlander, 1998). First, it is much easier to link academics to work-related issues and problems. A teacher of American history, for example, will have a much easier time demonstrating the relevance of historical knowledge and analytic methods to the field of health rather than inhalation therapy.

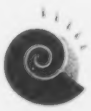
Second, the broader framework is equally suitable for students pursuing different forms

of postsecondary education or employment after high school. Identification with a health cluster, for example, does not presume that a high school student aspires to four-year college, community college, or immediate employment. In contrast, enrollment in a nursing assisting program almost inevitably labels a student as "non–college bound."

Third, the broader focus allows teachers to introduce more generic industry based knowledge into the program's content. A broad industry-based curriculum is more likely to increase students' understanding of major social and economic functions (transportation, communications, health, education, or agriculture). It also encourages more attention to (1) significant technological developments within a major industry, (2) economics (both the internal functioning of the industry, as well as its place in the larger economy), (3) systems of production and distribution, (4) the organization and functions of human resources, (5) the industry's interaction with government and the public sector; (6) environmental concerns, and (7) various aspects of health and safety (Finch, Frantz, Mooney, & Aneke, 1997).

Adopting career clusters and industry majors is, of course, a major undertaking. Merely relabeling carpentry, electricity, masonry, and plumbing "construction technology" and declaring it a career cluster is not likely to change the academic or vocational content offered to students enrolled in the program. Instead, the new framework must depart from the pre-baccalaureate, occupationally specific focus of traditional vocational education and build a new program based on the knowledge and expertise of academic, as well as vocational, faculty.

Educators experienced in making the shift to career clusters and industry majors stress the importance of truly transforming conventional vocational shops—for example, converting a carpentry class into a housing or environmental design studio that, in addition to carpentry skills, introduces students to selected aspects of architecture, community development, planning, construction economics, and public policy (Berman & Stemberg, 1997). Such a transformation is not easy. Vocational teachers are not likely to be fully prepared to introduce this new content, and academic teachers are not likely to have the industry-specific knowledge. Teachers, therefore, must learn along with their students and assume a new role as coach or lead investigator. Unfortunately, many faculty are not comfortable with abandoning the traditional role of "subject-expert."



Schoolwide Integration: Academies and Other Models

The most challenging and demanding form of integration is the creation of an academy or entire high school organized around a major industry or career area. It cannot be undertaken lightly and certainly not without the strong support of the administrative and governing leadership.

Though relatively few in number, strong examples of schoolwide integration have been around for some time. In New York City, Aviation High School, the Murray Bergtraum School of Business and Commerce, and the New York High School for the Performing Arts have long been recognized as demanding, rigorous schools that prepare students for a wide range of postsecondary and career options. Similarly, New York's outstanding Fashion Institute of Technology, a four-year college that is part of the State University of New York, offers students a liberal arts B.A. program structured around the world of fashion. In fact, undergraduate, graduate, and postgraduate postsecondary schools and programs organized around work and careers are common. Schools of medicine, law, dentistry, architecture, city planning, public policy, education, business, computer science, engineering, and social work all integrate advanced academics with focused application in the world of work. How ironic that strong emphasis on learning in the context of work is, for the most part, delayed until the highest levels of the American education enterprise, levels that many Americans never have the opportunity to attain.

One form of integration that aims to offer high school students some of the opportunities afforded by postsecondary professional schools is the career academy. Usually orga-

The most challenging and demanding form of integration is the creation of an academy or entire high school organized around a major industry or career area. It cannot be undertaken lightly and certainly not without the strong support of the administrative and governing leadership.

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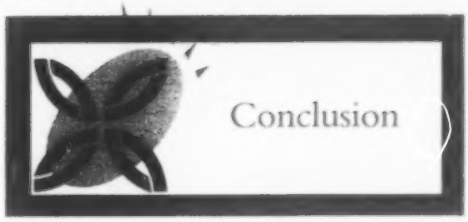
nized as a "school within schools," a career academy offers a two- to four-year program that combines a complete, rigorous academic course of study with a technical curriculum focused on a major career area or industry such as health, transportation, communications, finance, or hospitality (Raby, 1995). Typically, career academies also rely on strong partnerships with local businesses that provide advice, mentors, work-based learning opportunities, and often equipment and other resources.

Although academies and related models of industry-focused high schools probably represent the most advanced form of integrating education and work, they are not for everyone. Precisely because they do offer a focused, in-depth curriculum lasting several years, they are probably most effective for students who have a strongly developed interest in the industry or career area that is the focus of the academy. This requirement does not mean that a student must commit to a career in that particular industry; but ideally the student should have a strong interest in the field. A student in a health academy, for example, should at least be curious about the content and operations of the health industry, although the student's future career may well develop in another area. What is true for students also holds for teachers. Academy teachers, academic as well as vocational, should have a strong interest in the field, both for their own professional and intellectual development and to better engage students in interesting and authentic problems.

Students and teachers who do not have a well defined industry interest will probably find other forms of work-related integration—or for that matter, a traditional academic curriculum—more appealing. It is neither necessary nor desirable to lock in on one approach to integrating education and work. There is no single right way.



Integration is engaging and fun, but it is also hard work. Even in its simplest forms it requires teachers to depart from familiar instructional methods. Additionally, many students are also uneasy with new forms of instruction and initially resist teachers' use of new instructional practices. Although resources and firsthand experience with integration are growing, there is not yet enough practical guidance and useful curriculum to support teachers who want to make integration part of their practice. Consequently, curriculum development and building the skills of teachers to use integration should remain a high priority on the educational agenda of localities, states, and the nation at large.

When integration is pursued carefully and thoughtfully, it can offer students a deep and lasting understanding about how they will use knowledge and skill in their work and personal lives. That, of course, is why it's important for educators to continue trying to turn a generally accepted theory—that learning is enhanced by doing—into sound and effective educational practice.

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